

UPDATE TO THE STATUS REVIEW  
OF Howellia aquatilis

FIELD SURVEYS, MONITORING STUDIES,  
AND TRANSPLANT EXPERIMENTS

1989

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## I. INTRODUCTION

Howellia aquatilis Gray (Campanulaceae) is a strictly aquatic plant. It constitutes a monotypic genus, and has no close taxonomic relatives in Montana. The species grows as a mostly submerged plant, rooted in the bottom sediments of the ponds and sloughs to which it is adapted. It is an annual, completing its entire life cycle in one growing season.

This report summarizes the results of continuing studies, conducted in 1989, to assess the status of H. aquatilis; the species is designated as a sensitive plant by Region 1 of the U.S. Forest Service, and occurs on the Flathead National Forest. Previous reports summarize the status research conducted prior to the 1989 field season (Shelly 1988, 1989).

The field work conducted in 1989 represents the first year of a three-year inventory and analysis project. The purpose of this project is to assemble adequate information on the distribution and status of the species, in order to prepare a species management guide. The 1989 goals were:

- 1.) continue field surveys of potential habitat for H. aquatilis on the Flathead National Forest and adjacent lands.
- 2.) resurvey as many known populations as possible, emphasizing those found on Flathead National Forest lands, to obtain ongoing estimates of population size, condition, persistence, and response to management practices.
- 3.) resurvey potentially suitable habitats previously identified, but where the species was not found, to verify the absence of H. aquatilis.
- 4.) conduct transplant experiments, using soil plugs from known, dense populations; place plugs in unoccupied potential habitats at four locations. Document transplant locations and methods used.
- 5.) continue quantitative monitoring studies established at five locations in 1988; assess the suitability of the method used (line-intercept transects), and add frequency measurements to the studies.

Field studies were conducted by the authors (Montana Natural Heritage Program). Surveys and monitoring studies were conducted 11-14 and 17-20 July 1989. The transplants were completed on 27-28 September 1989.

## II. REVIEW OF PRESENT STATUS

Howellia aquatilis is currently included on the sensitive (Montana) and watch (Idaho) species lists in Region 1 of the U.S.



Forest Service (U.S. Department of Agriculture 1988; Reel *et al.* 1989), and the sensitive list in Region 5 (Shelly and Moseley 1988). In addition, it is a Category 2 (candidate) species, being considered for listing under the federal Endangered Species Act of 1973 (U.S. Department of Interior 1985). However, it was recently recommended for inclusion in Category 1 (Shelly and Moseley 1988); as of March, 1990, the U.S. Fish and Wildlife Service has not made a decision regarding this recommendation.

### III. UPDATE OF GEOGRAPHIC DISTRIBUTION

Upon conclusion of the 1989 field season, Howellia aquatilis was documented from a total of 74 extant populations worldwide: 1 in Idaho, 57 in Montana, and 16 in Washington. All known Montana populations are located in the Swan River drainage (Lake and Missoula counties). Within this drainage a total of 420 wetlands have been surveyed; H. aquatilis has been found in 57 (13.6%) of them. The Montana populations constitute 77% of those known globally for the species. Thirty-seven populations (50.0% of those known globally) occur wholly or partially on Flathead National Forest lands. The land ownership status of the Montana populations is summarized in Table 1.

One pond that had been surveyed in 1987, but was not observed to support H. aquatilis, contained the species in 1989 (occurrence number 056). One new population was discovered in a previously unsurveyed pond (occurrence number 057). Twenty apparently suitable ponds that were previously found not to support the species yielded negative results again. Five previously unsurveyed ponds were studied, but did not contain H. aquatilis. Additionally, through the use of aerial photographs, five previously recorded populations were more accurately mapped (008, 014, 015, 016, 017).

Element occurrence print-outs and location maps for the two new and five remapped populations are included in Section VII, pp. 12-49. The locations of the ponds that were surveyed (either initially in 1989 or for the second time), but apparently do not support Howellia aquatilis, are indicated on the maps in Section VII, pp. 42-49.

### IV. MONITORING STUDIES

Details regarding population size and condition for the two newly discovered occurrences are summarized in Table 2, p. 4.

During 1989, 26 previously documented populations were re-surveyed, and estimates of population size were made. Quantitative monitoring studies of five populations (008, 009, 013, 020, and 027) were continued. The locations of all of these study sites are shown in an earlier status review (Shelly 1988).

Table 1. Summary of land ownership for Montana populations of Howellia aquatilis.

County	Site name	Number of populations on Flathead N.F. lands	Number of populations on Flathead N.F. <u>and</u> private lands	Number of populations on private lands
Lake	Lost Creek- Cilly Creek	11	0	0
Lake	Dog Creek	2	0	0
Lake	Swan River West	1	0	0
Lake	Salmon Prairie	0	1	0
Lake	Swan River Oxbow	0	1	0
Missoula	Condon Creek	9	0	4
Missoula	Elk Creek	1	1	0
Missoula	Kraft Creek	0	0	1
Missoula	Lindbergh Lake	9	1	15
<b>TOTAL</b>		<b>33</b>	<b>4</b>	<b>20</b>

TABLE 2. Population size and condition for Howellia aquatilis occurrences newly documented in 1989.

Occurrence number: 056

Site name: LINDBERGH LAKE

Acreage: 1

Population size and condition: 27 PLANTS COUNTED IN 1989 (NONE WERE FOUND IN 1987); ALL PLANTS WERE FOUND IN THE SOUTH END OF THE POND; HABITAT CURRENTLY SURROUNDED BY DENSE, UNDISTURBED TIMBER STANDS.

Occurrence number: 057

Site name: LOST CREEK-CILLY CREEK PONDS

Acreage: 1

Population size and condition: 22 PLANTS COUNTED; ALL INDIVIDUALS OCCUR NEAR NORTH END OF POND; REMAINDER OF POND IS SUITABLE, BUT APPARENTLY UNOCCUPIED, HABITAT; SURROUNDING FOREST CURRENTLY INTACT.

The methods for the quantitative monitoring studies are described by Shelly (1989).

**RESULTS:** The results of the population size surveys are presented in Table 3. Even though these figures are to be strictly regarded as estimates, they indicate that most populations remained fairly stable in size from 1987 to 1989. Obvious changes in abundance were noted in four populations (012, 023, 025, 056). Also included in Table 3 are 1989 estimates of the percentage of each pond that is occupied by H. aquatilis. These estimates correlate well with the population size estimates (smaller populations generally occupy the smallest percentage of suitable habitat). These percentage figures may provide an additional means of tracking the abundance of H. aquatilis through time, and can often be obtained without adversely affecting the populations.

The results from the line-transect studies for two years are presented in Table 4, pp. 7-8. The four ponds for which water depth measurements were taken in both 1988 and 1989 were all deeper during the second year, which was more normal with respect to precipitation and run-off. Pond numbers 020 and 027 were significantly fuller during 1989.

The percent cover of Howellia aquatilis was higher in 1989 than in 1988 in four of the five ponds studied. Significant increases were noted in two of these (008 and 020), in which the percent cover along the line transects increased from 8.21 to 27.40, and 26.29 to 59.21, respectively. These observations are in keeping with previously observed fluctuations in population size (Shelly and Moseley 1988).

**DISCUSSION:** The possible reasons for fluctuating sizes in Howellia populations are addressed by Lesica (1990), and include the date of pond drying each year; it is hypothesized that optimal population development occurs in sites that dry down in wet years and do not dry too early in dry years. If drying occurs too early in the season, seed production may be reduced; if drying is much delayed during a wet year, the normal fall germination of seeds would be much reduced or eliminated. Either of these events could result in much lower numbers of individuals the following year. The observed decline in population 012 may have been a result of a suboptimal drying regime in 1988 (a drought year). If that pond had dried too early owing to the drought conditions, seed production could have been so reduced that the low number of observed individuals in 1989 may have resulted. Conversely, the observed increases in estimated abundance in populations 023 and 025, and the measured increases in populations 008 and 020, may reflect optimal drying regimes (and resultant germination success) at those sites during 1988; the appearance of H. aquatilis in pond 056 in 1989 may also reflect favorable conditions in 1988. These results suggest that every pond is different with respect to drying regime and



Table 3. Population size estimates (number of individuals), and percentage of pond occupied, for 28 Howellia aquatilis occurrences, Swan River valley, Montana.

OCCURRENCE NUMBER	1987	1989	EST. % OF POND OCCUPIED (1989)
001*	75-100+	300-400	60
006	1000-2000	1000-2000	50
007	3000-4000	1000-2000	95
008	2000-3000	1000-1500	50
009*	500-600	500-1000	30
<b>012*</b>	<b>400-500</b>	<b>16</b>	<b>&lt;5</b>
013*	1000-1500	500-1000	50
014*	300-400	500+	50
016	400+	1000-1500	85
017	10-12	10-20	<5
020	1000	1000-1500	60
022	200	500-1000	70
<b>023</b>	<b>3</b>	<b>400-500</b>	<b>55</b>
<b>025*</b>	<b>25</b>	<b>100-125</b>	<b>&lt;5</b>
026	200-300	500-1000	70
027*	300	300-400	40
029*	200-300	500-1000	30
030*	1000	1000	55
032	101-1000 (1983)	750-1000	40
035	51-1000 (1983)	500-750	40
044	275-400	90-120	60
045	300	300-400	20
046*	50	30-50	<5
047*	200	200-300	20
048*	250	200	10
049	1500-2000	2000+	65
<b>056</b>	<b>0</b>	<b>27</b>	<b>10</b>
057	-	22	<5

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\* - Ponds whose margins or immediate surroundings have been physically impacted by timber harvesting.

Table 4. Monitoring transect data, Howellia aquatilis and major associated species, Swan Valley, Montana, 1988-89. Cover data expressed as percentage of transect length occupied by the "canopy" of each species, as measured along line-intercept transects.

<u>Occurrence number</u>	<u>008</u>	<u>009</u>	<u>013</u>	<u>020</u>	<u>027</u>
Date read 1988:	21 JUL	21 JUL	21 JUL	22 JUL	22 JUL
1989:	12 JUL	12 JUL	11 JUL	14 JUL	13 JUL
Transect length (m)	48.95	50.0	46.0	42.9	50.0
Water depth (dm)					
Tape point (m):	20.0	20.0	15.0	10.0	15.0
	40.0	40.0	30.0	23.0	30.0
1988	not measured	3.1	1.7	2.72	1.96
		3.2	1.8	2.64	1.50
1989	3.4	3.45	2.4	4.45	4.5
	4.95	3.55	2.2	4.35	4.0
Estimated % cover:	1988				
	1989				
<u>Howellia aquatilis</u>	8.21	7.06	6.44	26.29	1.80
	27.40	7.24	4.87	59.21	5.86
% frequency (1989):	56	36	69	95	40
<u>Alopecurus</u>	-	-	-	-	-
<u>aequalis</u>	-	-	-	8.74	-
<u>Carex atherodes</u>	-	-	-	-	9.40
	-	-	-	-	34.0
<u>Carex rostrata</u>	19.10	-	19.37	9.88	14.96
	32.93	-	20.37	9.98	14.2
<u>Carex vesicaria</u>	6.41	1.94	55.72	10.96	1.66
	6.50	2.00	52.74	16.81	22.64

TABLE 4. (CONT.).

<u>Eleocharis</u>	*	-	21.02	-	11.70
<u>palustris</u>	50.05	-	15.85	-	12.88
<u>Equisetum</u>	-	98.26	-	-	-
<u>fluviatile</u>	-	100.0	-	-	-
<u>Glyceria borealis</u>	-	-	-	5.43	22.72
	0.51	-	-	1.42	16.72
<u>Glyceria</u>	-	-	-	-	-
<u>grandis</u>	-	-	-	7.69	-
<u>Phalaris</u>	3.47	-	-	-	24.76
<u>arundinacea</u>	2.55	-	-	-	25.74
<u>Ranunculus</u>	-	-	-	35.62	-
<u>aquatilis</u> (1989)					
<u>Sium suave</u>	53.81	6.18	3.78	6.83	1.95
	62.0	16.78	6.26	15.34	19.16
Fallen logs	2.12	4.02	4.70	1.82	1.50
	2.02	9.04	3.17	4.03	4.46
Open water (1989)	8.11	-	6.87	2.87	2.28
Open soil (1989)	-	-	0.98	-	-

\* - Eleocharis palustris was scattered throughout the pond (1988).



subsequent population response. Additional data regarding the actual dates of drying, as well as other climatic factors, are needed to more closely determine the nature of these observed fluctuations.

The line transect results revealed an increase in July water depth in ponds 020 and 027 between 1988 and 1989. An increase in percent cover of H. aquatilis and Carex vesicaria, and a decrease for Glyceria borealis, was also recorded over this two-year interval. Alternatively, July water depths in ponds 009 and 013 did not fluctuate much between the two years, and the percent cover of H. aquatilis and C. vesicaria remained approximately the same during this interval (G. borealis was not encountered along the transects in the latter two ponds). These results also suggest that year-to-year fluctuations in water depth and rate of drying are important in determining the abundance of aquatic plant species. A third year of transect data will be useful in evaluating whether these observed trends are consistent.

## V. TRANSPLANT EXPERIMENTS

During 1989, soil plugs for transplant experiments were obtained from two ponds containing dense populations of H. aquatilis. The transplants were placed in four ponds that appeared to be suitable habitat for H. aquatilis, but that had not been observed to support the species.

**STUDY SITES:** The ponds from which soil plugs were taken are occurrence numbers 007 and 049; the locations of these populations are indicated in an earlier status report (Shelly 1988). The plugs from population 007 were placed in two ponds near Flathead National Forest Rd. #10161 (Lake County):

- A.) T24N R17W Section 6, SE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ ; 955.8 m (3135').
- B.) T24N R18W Section 1, NE $\frac{1}{4}$ SE $\frac{1}{4}$ ; 942.1 m (3090').

The locations of these transplant sites are shown on p. 48.

The plugs from population 049 were placed in two ponds near Flathead National Forest Rd. #10566 (Missoula County):

- C.) T19N R17W Section 12, NW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ ; 1295.7 m (4250').
- D.) T19N R17W Section 12, SW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ ; 1291.2 m (4235').

The locations of these transplant sites are shown on p. 43.

**METHODS:** At each of the "donor" ponds, soil plugs were taken from areas where dense populations of H. aquatilis had been observed during peak growth and flowering times (mid-July). The plugs were obtained by pressing a #10 tin can into the pond sediments to a depth of approximately 9-13 cm. The areas of the ponds where the plugs were collected were moist, but not under water. The presence of H. aquatilis seeds was verified in the

field, in several of the plugs from each "donor" pond.

Thirty plugs were taken from each "donor" pond, and placed in plastic bags for transport to the transplant sites. Fifteen plugs were placed along transects in each of the four transplant ponds. The ends of these transects are marked with steel posts that were painted orange. The plugs were placed in the transplant ponds as follows:

POND	TRANSECT LOCATION; DIRECTION READ	TRANSECT BEARING	PLUG PLACEMENT
A	Across west edge of pond; S->N	320°	1.6, 3.1, 6.0, and 8.4 m, then every 2 m from 10.0 to 30.0 m.
B	Along southeastern edge of pond; W->E	76°	Every 2 m from 2.0-10.0 m and 20.0-24.0 m; every 1 m from 12.0-18.0 m.
C	Along northeastern edge of pond; N->S	177°	Every 2 m, from 2.0-30.0 m.
D	Along northeastern edge of pond; N->S	141°	Every 2 m, from 2.0-30.0 m.

The transects in ponds A and B were not under water on the transplant date (27 SEP 1989). Soil plugs were placed in holes dug in the pond sediments with the tin can. The transects in ponds C and D were placed in water approximately 30 cm and 25 cm deep, respectively (28 SEP 1989); the plugs were placed on the pond bottoms.

The transplant transects should be re-visited in mid-July, 1990, to assess success. Ponds where the plugs were placed under water (C and D) should be thoroughly surveyed; some *H. aquatilis* seeds were observed to float when the plugs were put in the water, and those seeds may have become established away from the transect lines.

**DISCUSSION:** Recent detailed studies of the seed germination ecology of *H. aquatilis* indicate that the species is not capable of germinating under water (Lesica 1990). In these transplant experiments, two of the four ponds receiving soil plugs still contained water on the transplant date (C and D); it is unlikely that these ponds dried out much further prior to freezing. The transects in the other ponds (A and B) were not under water on the transfer date. Thus, these different transplanting treatments may provide a field test of the observed laboratory germination of *H. aquatilis* seeds. Also, 1990 and 1991 observations of the ponds that did not dry in 1989 may substantiate the hypothesis that, in ponds that do not dry by the



end of the growing season, the seed bank (created in this case by transplanting) will persist for only a few years (Lesica 1990). Lastly, it is hoped that the transplant experiments will provide an assessment of the feasibility of these techniques in augmenting or recovering populations of H. aquatilis.

## VI. STUDY RECOMMENDATIONS

During continuation of these studies in 1990, the following goals should be emphasized:

- 1.) continuation of line transect monitoring studies. After completion of these studies in 1990, a critical evaluation of the method should be made, as it is disruptive to the habitat and may not be providing meaningful information on population trends. Periodic checks of populations, and estimates of their size, may be the most effective, least disturbing approach.
- 2.) conduct studies of the pond drying dates for selected locations, to determine more closely the influence that this factor may have on the abundance of H. aquatilis in the subsequent year.
- 3.) monitor the transplant locations, to determine success and assess the feasibility of this method for augmenting and/or recovering populations.
- 4.) resurvey known occurrences that were monitored in 1987 and 1989, to continue population size/trend studies.
- 5.) continue inventory of previously unsurveyed habitats; this study goal should be largely completed during the 1990 field season.

## VII. ELEMENT OCCURRENCE PRINT-OUTS AND MAPS

Print-outs are provided for the 28 populations that were re-surveyed in 1989; the "element occurrence data" field includes the estimated population sizes for 1983, 1987 and/or 1989. Occurrence number 015 is also included because it was mapped more accurately using aerial photographs; it was not resurveyed in 1989.

Element occurrence print-outs for the remaining populations are contained in the earlier status reports (Shelly 1988, 1989).

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.001

Survey site name: LINDBERGH LAKE  
County: Missoula

USGS quadrangle: CYGNET LAKE

Township-range: 019N017W    Section: 12  
Township-range comments: NE4SE4NW4

Survey date:	1984-07-15	Elevation:	4230
First observation:	1984	Slope/aspect:	LEVEL
Last observation:	1989-07-18	Size (acres):	2

Location:

SWAN VALLEY, 0.68 AIR MILES NNE. FROM THE FIRST FORK ON  
LINDBERGH LAKE ROAD, CA. 2.5 MILES WEST FROM ST. HWY. 83.

Element occurrence data:

EST. 75-100+ PLANTS (1987); CA. 300-400 PLANTS (1989); NORTH  
END OF POND IMPACTED BY LOGGING, WITH SOME SLASH PILED INTO  
THE WATER.

General site description:

GLACIAL POTHOLE; WITH CAREX VESICARIA, SIUM SUAVE,  
RANUNCULUS GMELINII; POPULUS TRICHOCARPA, PINUS CONTORTA,  
LARIX OCCIDENTALIS, SALIX SP. AROUND POND.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.006

Survey site name: CONDON CREEK  
County: Missoula

USGS quadrangle: CONDON

Township-range: 021N016W    Section: 18  
Township-range comments: NE4NW4SW4

Survey date:	1986-07-14	Elevation:	3740
First observation:	1986	Slope/aspect:	LEVEL
Last observation:	1989-07-14	Size (acres):	1

Location:

SWAN VALLEY, WEST BASE OF SWAN RANGE UPLIFT, 3.5 AIR MILES  
NORTH OF CONDON, 2.1 AIR MILES EAST OF ST. HWY. 83, 0.1 AIR  
MILES SOUTH OF CONDON CREEK.

Element occurrence data:

EST. 1000-2000 PLANTS (1987 AND 1989); MANY PLANTS DISTURBED  
BY MOOSE AND/OR WATERFOWL ACTIVITY; AREA IS ACTIVELY  
THREATENED BY LOGGING ROAD CONSTRUCTION AND TIMBER  
HARVESTING.

General site description:

VERNAL POND, IN PINUS PONDEROSA/LARIX OCCIDENTALIS FOREST;  
WITH SIUM SUAVE, CAREX VESICARIA, RANUNCULUS AQUATILIS,  
VERONICA CATENATA, CALLITRICHE HETEROPHYLLA.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

VOUCHER-LESICA, P. (3965), 1986, SPECIMEN #104450 (MONTU).

Information source:

LESICA, PETER. DIVISION OF BIOLOGICAL SCIENCES, UNIVERSITY  
OF MONTANA, MISSOULA, MT 59812.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.007

Survey site name: SWAN RIVER WEST  
County: Lake

USGS quadrangle: CILLY CREEK

Township-range: 024N018W    Section: 14  
Township-range comments: SW4SE4SE4

Survey date:	1987-07-01	Elevation:	3190
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-13	Size (acres):	1

Location:

WEST SIDE OF SWAN VALLEY, 1.4 AIR MILES WEST OF ST. HWY. 83;  
0.57 AIR MILE WEST OF SWAN RIVER; CA. 6.5 AIR MILES SOUTH OF  
SWAN LAKE (TOWN).

Element occurrence data:

ABOUT 3000-4000 PLANTS, POSSIBLY MORE (1987); 1000-2000  
PLANTS (1989); VERY DENSE, AND FORMING MATS, IN WEST POND;  
THE TWO PONDS, WHICH ARE SEPARATED BY A SALIX BORDER, ARE  
JOINED BY HIGHER WATER IN THE SPRING.

General site description:

IN TWO SMALL, ADJACENT GLACIAL POTHOLE, IN 1-2 FEET OF  
WATER; WITH CAREX VESICARIA, EQUISETUM FLUVIATILE, SIUM  
SUAVE; POPULUS TRICHOCARPA, BETULA PAPYRIFERA AROUND PONDS.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

VOUCHER-SHELLY, J.S. (1356), 1987, MONTU. pH = 7.20 IN WEST  
POND.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.



HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.008

Survey site name: LOST CREEK-CILLY CREEK PONDS  
County: Lake

USGS quadrangle: CILLY CREEK

Township-range: 024N017W    Section: 06  
Township-range comments: N2SE4

Survey date:	1987-07-07	Elevation:	3190
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-12	Size (acres):	2

Location:

SWAN VALLEY, CA. 4.5 AIR MILES SSE. OF SWAN LAKE (TOWN); 0.5  
AIR MILES EAST OF ST. HWY. 83; 0.5 AIR MILES SSE. OF  
CONFLUENCE OF NORTH AND SOUTH FORKS LOST CREEK.

Element occurrence data:

EST. 2000-3000 PLANTS, IN A SINGLE POND (1987); 1000-1500  
PLANTS (1989); SURROUNDED BY A RELATIVELY UNDISTURBED  
FOREST, WHICH WAS REPORTEDLY LIGHTLY SELECTIVELY LOGGED IN  
ABOUT 1910.

General site description:

THROUGHOUT A GLACIAL POTHOLE POND, BOTTOM SOIL OF CONSOL-  
IDATED CLAY MUCK; WITH SIUM SUAVE, RANUNCULUS AQUATILIS,  
GLYCERIA BOREALIS, CAREX VESICARIA, POTAMOGETON, ELEOCHARIS.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

VOUCHER-SHELLY, J.S. (1358) AND ANNE MORLEY, 1987, MONTU.  
pH=7.57.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.009

Survey site name: LOST CREEK-CILLY CREEK PONDS  
County: Lake

USGS quadrangle: CILLY CREEK

Township-range: 024N017W    Section: 07  
Township-range comments: NE4NE4NE4

Survey date:	1987-07-01	Elevation:	3250
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-12	Size (acres):	3

Location:

SWAN VALLEY, 0.6 AIR MILES EAST OF ST. HWY. 83, 0.6 AIR  
MILES SOUTH OF SOUTH FORK LOST CREEK, CA. 5.0 AIR MILES SSE  
OF SWAN LAKE (TOWN).

Element occurrence data:

EST. 500-600 PLANTS (1987); 500-1000 PLANTS (1989); SPECIES  
DOES NOT OCCUPY ALL OF THE AVAILABLE, SUITABLE HABITAT AT  
THIS SITE; AREAS AROUND SOUTH AND EAST SIDES OF POND  
CLEARCUT CA. 15 YEARS AGO.

General site description:

IN SHALLOW WATER OF A GLACIAL POND, ORGANIC CLAY BOTTOM;  
WITH EQUISETUM FLUVIATILE, CAREX VESICARIA, SIUM SUAVE;  
POPULUS TRICHOCARPA BORDERING POND.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

VOUCHER-SHELLY, J.S. (1357) AND ANNE MORLEY, 1987, MONTU.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.012

Survey site name: LOST CREEK-CILLY CREEK PONDS  
County: Lake

USGS quadrangle: CILLY CREEK

Township-range: 024N017W    Section: 08  
Township-range comments: NE4SW4NW4, SE4NW4NW4

Survey date:	1987-07-07	Elevation:	3235
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-11	Size (acres):	2

Location:

SWAN VALLEY, 0.83 AIR MILES EAST OF ST. HWY 83, 0.37 AIR  
MILES NORTH OF CILLY CREEK, CA. 5.0 AIR MILES SSE OF SWAN  
LAKE (TOWN).

Element occurrence data:

EST. 400-500 PLANTS (1987); 16 PLANTS COUNTED IN 1989; MUCH  
OF POND HAS NO VEGETATION; LOGGING HAS OCCURRED AROUND POND.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION, SOILS FAIRLY UN-  
CONSOLIDATED; WITH NUPHAR VARIEGATUM, SIUM SUAVE, POTAMOGE-  
TON SP., POPULUS TRICHOCARPA, BETULA PAPYRIFERA AROUND POND.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED; SITE SURVEYED  
WITH ANNE MORLEY (SWAN LAKE, MT).

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.013

Survey site name: LOST CREEK-CILLY CREEK PONDS  
County: Lake

USGS quadrangle: CILLY CREEK

Township-range: 024N017W    Section: 08  
Township-range comments: N2SW4NW4

Survey date:	1987-07-07	Elevation:	3240
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-11	Size (acres):	2

Location:

SWAN VALLEY, 0.79 AIR MILES EAST OF ST. HWY 83, 0.36 AIR  
MILES NORTH OF CILLY CREEK, CA. 5.0 AIR MILES SSE OF SWAN  
LAKE (TOWN).

Element occurrence data:

EST. 1000-1500 PLANTS (1987); 500-1000 PLANTS (1989);  
LOGGING HAS OCCURRED AROUND POND.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; OPENINGS AMONG CA-  
REX VESICARIA, WITH SIUM SUAVE, ELEOCHARIS PALUSTRIS, CAREX  
ROSTRATA; POPULUS TRICHOCARPA, BETULA PAPYRIFERA AROUND POND

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

VOUCHER - SHELLY, J.S. (1359) AND ANNE MORLEY, 1987, MONTU.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.014

Survey site name: LOST CREEK-CILLY CREEK PONDS  
County: Lake

USGS quadrangle: CILLY CREEK

Township-range: 024N017W    Section: 08  
Township-range comments: NW4SW4NW4

Survey date:	1987-07-07	Elevation:	3245
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-12	Size (acres):	2

Location:

SWAN VALLEY, 0.68 AIR MILES EAST OF ST. HWY 83, 0.44 AIR  
MILES NORTH OF CILLY CREEK, CA. 5.0 AIR MILES SSE OF SWAN  
LAKE (TOWN).

Element occurrence data:

EST. 300-400 PLANTS (1987); 500+ PLANTS (1989); LOGGING HAS  
OCCURRED IN ADJACENT FORESTS.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; AROUND LOGS & IN  
OPENINGS AMONG CAREX VESICARIA, WITH SIUM SUAVE, POTAMOGETON  
SPP; POPULUS TRICHOCARPA, P. TREMULOIDES, BETULA PAPYRIFERA.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED; SITE SURVEYED  
WITH ANNE MORLEY (SWAN LAKE, MT); pH = 7.00.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.015

Survey site name: LOST CREEK-CILLY CREEK PONDS  
County: Lake

USGS quadrangle: CILLY CREEK

Township-range: 024N017W    Section: 08  
Township-range comments: NW4SW4NW4

Survey date:	1987-07-07	Elevation:	3245
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1987-07-07	Size (acres):	2

Location:

SWAN VALLEY, 0.69 AIR MILES EAST OF ST. HWY 83, 0.39 AIR  
MILES NORTH OF CILLY CREEK, CA. 5.0 AIR MILES SSE OF SWAN  
LAKE (TOWN).

Element occurrence data:

EST. 300+ PLANTS (1987); LOGGING HAS OCCURRED IN ADJACENT  
FORESTS; THIS POND WAS DRYING FASTER THAN OTHERS AT THIS  
SITE.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; WITH CAREX VESICA-  
RIA, SIUM SUAVE, VERONICA CATENATA, SALIX SPP.; POPULUS TRI-  
CHOCARPA, P. TREMULOIDES BORDERING POND.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED; SITE SURVEYED  
WITH ANNE MORLEY (SWAN LAKE, MT).

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.



HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.016

Survey site name: LOST CREEK-CILLY CREEK PONDS  
County: Lake

USGS quadrangle: CILLY CREEK

Township-range: 024N017W    Section: 07  
Township-range comments: SE4SE4NE4, NE4NE4SE4

Survey date:	1987-07-07	Elevation:	3235
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-12	Size (acres):	2

Location:

SWAN VALLEY, 0.61 AIR MILES EAST OF ST. HWY 83, 0.18 AIR  
MILES NORTH OF CILLY CREEK, CA. 5.0 AIR MILES SSE OF SWAN  
LAKE (TOWN).

Element occurrence data:

EST. 400+ PLANTS (1987); 1000-1500 PLANTS (1989); ADJACENT  
TO LOGGING ROAD.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; WITH CAREX VESICA-  
RIA, SIUM SUAVE; POPULUS TRICHOCARPA BORDERING POND.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED; SITE SURVEYED  
WITH ANNE MORLEY (SWAN LAKE, MT).

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.



HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.017

Survey site name: LOST CREEK-CILLY CREEK PONDS  
County: Lake

USGS quadrangle: CILLY CREEK

Township-range: 024N017W    Section: 08  
Township-range comments: SW4SW4NW4

Survey date:	1987-07-07	Elevation:	3245
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-12	Size (acres):	3

Location:

SWAN VALLEY, 0.71 AIR MILES EAST OF ST. HWY 83, 0.25 AIR  
MILES NORTH OF CILLY CREEK, CA. 5.0 AIR MILES SSE OF SWAN  
LAKE (TOWN).

Element occurrence data:

EST. 10-12 PLANTS (1987); 10-20 PLANTS (1989); ADJACENT TO  
LOGGING ROAD; THIS DEPRESSION WAS MUCH DRYER THAN THE  
OTHERS, HOWELLIA AQUATILIS PRESENT IN A FEW PUDDLES; HABITAT  
MAY BE MORE ADVANCED SUCCESSIONALLY THAN NEARBY PONDS.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; WITH CAREX VESI-  
CARIA, SIUM SUAVE, POTAMOGETON, CAREX ROSTRATA, POTENTILLA  
PALUSTRIS; POPULUS TREMULOIDES AROUND POND.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

SIGHT RECORD; NO VOUCHER SPECIMEN COLLECTED; SITE SURVEYED  
WITH ANNE MORLEY (SWAN LAKE, MT).

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.020

Survey site name: CONDON CREEK  
County: Missoula

USGS quadrangle: CONDON

Township-range: 021N016W    Section: 18  
Township-range comments: SW4NE4SW4

Survey date:	1987-07-02	Elevation:	3740
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-14	Size (acres):	2

Location:

SWAN VALLEY, 3.3 AIR MILES NORTH OF CONDON, 2.13 AIR MILES  
EAST OF ST. HWY 83, 0.25 AIR MILES SOUTH OF CONDON CREEK.

Element occurrence data:

EST. 1000 PLANTS (1987); 1000-1500 PLANTS (1989); NEARBY  
FORESTS RECENTLY LOGGED.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; WITH SIUM SUAVE,  
CAREX VESICARIA; POPULUS TRICHOCARPA, PINUS PONDEROSA, LARIX  
OCCIDENTALIS IN SURROUNDING FOREST.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED. pH=7.28.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.022

Survey site name: CONDON CREEK  
County: Missoula

USGS quadrangle: CONDON

Township-range: 021N016W    Section: 18  
Township-range comments: SW4NE4SW4

Survey date:	1987-07-02	Elevation:	3750
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-14	Size (acres):	1

Location:

SWAN VALLEY, 3.28 AIR MILES NORTH OF CONDON, 2.18 AIR MILES  
EAST OF ST. HWY 83, 0.27 AIR MILES SOUTH OF CONDON CREEK.

Element occurrence data:

EST. 200 PLANTS (1987); 500-1000 PLANTS (1989); NEARBY  
FORESTS RECENTLY LOGGED.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; WITH SIUM SUAVE,  
CAREX VESICARIA; POPULUS TRICHOCARPA, PINUS PONDEROSA, LARIX  
OCCIDENTALIS IN SURROUNDING FOREST.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.023

Survey site name: CONDON CREEK  
County: Missoula

USGS quadrangle: CONDON

Township-range: 021N016W    Section: 18  
Township-range comments: NW4SE4SW4

Survey date:	1987-07-02	Elevation:	3740
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-14	Size (acres):	1

Location:

SWAN VALLEY, 3.2 AIR MILES NORTH OF CONDON, 2.10 AIR MILES  
EAST OF ST. HWY 83, 0.35 AIR MILES SOUTH OF CONDON CREEK.

Element occurrence data:

3 PLANTS (1987); 400-500 PLANTS IN 1989; SEVERAL HUNDRED  
PLANTS OBSERVED IN 1986 BY P. LESICA; NEARBY FORESTS  
RECENTLY LOGGED.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; WITH SIUM SUAVE,  
CAREX VESICARIA; POPULUS TRICHOCARPA, PINUS PONDEROSA, LARIX  
OCCIDENTALIS IN SURROUNDING FOREST.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.025

Survey site name: CONDON CREEK  
County: Missoula

USGS quadrangle: CONDON

Township-range: 021N016W    Section: 18  
Township-range comments: S2SE4SW4

Survey date:	1987-07-02	Elevation:	3750
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-14	Size (acres):	2

Location:

SWAN VALLEY, 3.08 AIR MILES NORTH OF CONDON, 2.18 AIR MILES  
EAST OF ST. HWY 83, 0.45 AIR MILES SOUTH OF CONDON CREEK.

Element occurrence data:

EST. 25 PLANTS (1987); 100-125 PLANTS (1989); POND MARGINS  
RECENTLY DISTURBED BY LOGGING.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; WITH SIUM SUAVE,  
CAREX VESICARIA; POPULUS TRICHOCARPA, PINUS PONDEROSA, LARIX  
OCCIDENTALIS IN SURROUNDING FOREST.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED.

Information source:

CAMPBELL, L. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 2 JULY AND 9-10 JULY.



HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.026

Survey site name: CONDON CREEK  
County: Missoula

USGS quadrangle: CONDON

Township-range: 021N016W    Section: 18  
Township-range comments: SE4NW4SW4

Survey date:	1987-07-02	Elevation:	3710
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-14	Size (acres):	1

Location:

SWAN VALLEY, 3.29 AIR MILES NORTH OF CONDON, 1.97 AIR MILES  
EAST OF ST. HWY 83, 0.28 AIR MILES SOUTH OF CONDON CREEK.

Element occurrence data:

EST. 200-300 PLANTS (1987); 500-1000 PLANTS (1989); NEARBY  
FORESTS RECENTLY LOGGED.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; WITH SIUM SUAVE,  
CAREX VESICARIA; POPULUS TRICHOCARPA, PINUS PONDEROSA, LARIX  
OCCIDENTALIS IN SURROUNDING FOREST.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.027

Survey site name: CONDON CREEK  
County: Missoula

USGS quadrangle: CONDON

Township-range: 021N016W    Section: 18  
Township-range comments: NW4SW4SW4

Survey date:	1987-07-02	Elevation:	3690
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-13	Size (acres):	2

Location:

SWAN VALLEY, 3.18 AIR MILES NORTH OF CONDON, 1.84 AIR MILES  
EAST OF ST. HWY 83, 0.40 AIR MILES SOUTH OF CONDON CREEK.

Element occurrence data:

EST. 300 PLANTS (1987); 300-400 PLANTS (1989); SOUTH MARGIN  
OF POND RECENTLY DISTURBED BY LOGGING.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; WITH SIUM SUAVE,  
CAREX VESICARIA; POPULUS TRICHOCARPA, PINUS PONDEROSA, LARIX  
OCCIDENTALIS IN SURROUNDING FOREST.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED. pH=7.66.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.029

Survey site name: CONDON CREEK  
County: Missoula

USGS quadrangle: CONDON

Township-range: 021N016W    Section: 19  
Township-range comments: NW4NW4NW4

Survey date:	1987-07-02	Elevation:	3690
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-14	Size (acres):	2

Location:

SWAN VALLEY, 2.97 AIR MILES NORTH OF CONDON, 1.88 AIR MILES  
EAST OF ST. HWY 83, 0.59 AIR MILES SOUTH OF CONDON CREEK.

Element occurrence data:

EST. 200-300 PLANTS (1987); 500-1000 PLANTS (1989); POND  
MARGINS RECENTLY DISTURBED BY LOGGING.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; WITH SIUM SUAVE,  
CAREX VESICARIA; POPULUS TRICHOCARPA, PINUS PONDEROSA, LARIX  
OCCIDENTALIS IN SURROUNDING FOREST.

Land owner/manager:

BURLINGTON NORTHERN LAND

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.030

Survey site name: CONDON CREEK  
County: Missoula

USGS quadrangle: CONDON

Township-range: 021N016W    Section: 19  
Township-range comments: NE4NE4NW4

Survey date:	1987-07-02	Elevation:	3740
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-14	Size (acres):	1

Location:

SWAN VALLEY, 2.99 AIR MILES NORTH OF CONDON, 2.19 AIR MILES  
EAST OF ST. HWY 83, 0.55 AIR MILES SOUTH OF CONDON CREEK.

Element occurrence data:

EST. 1000 PLANTS (1987 AND 1989); POND MARGINS RECENTLY  
DISTURBED BY LOGGING.

General site description:

IN SHALLOW WATER OF A GLACIAL DEPRESSION; WITH SIUM SUAVE,  
CAREX VESICARIA; POPULUS TRICHOCARPA, PINUS PONDEROSA, LARIX  
OCCIDENTALIS IN SURROUNDING FOREST.

Land owner/manager:

BURLINGTON NORTHERN LAND

Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED.

Information source:

CAMPBELL, L. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 2 JULY AND 9-10 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.032

Survey site name: LINDBERGH LAKE  
County: Missoula

USGS quadrangle: CYGNET LAKE

Township-range: 019N016W    Section: 07  
Township-range comments: SE4SW4NW4

Survey date:	1983-07-24	Elevation:	4165
First observation:	1983	Slope/aspect:	LEVEL
Last observation:	1989-07-18	Size (acres):	2

Location:

SWAN VALLEY, 0.16 AIR MILES SOUTH OF LINDBERGH LAKE RD., CA.  
1.75 AIR MILES WEST OF ST. HWY 83.

Element occurrence data:

EST. 101-1000 PLANTS (1983); 750-1000 PLANTS (1989).

General site description:

GLACIAL POTHOLE, IN ONE TO TWO FEET OF WATER; WITH EQUISETUM  
FLUVIATILE, SIUM SUAVE, TYPHA, CAREX ROSTRATA; POPULUS TRI-  
CHOCARPA, P. TREMULOIDES AROUND POND.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:

Information source:

PIERCE, J. 737 LOCUST ST., MISSOULA, MT 59802



HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.035

Survey site name: LINDBERGH LAKE  
County: Missoula

USGS quadrangle: CYGNET LAKE

Township-range: 019N016W    Section: 07  
Township-range comments: E2NE4SW4

Survey date:	1983-07-24	Elevation:	4150
First observation:	1983	Slope/aspect:	LEVEL
Last observation:	1989-07-18	Size (acres):	2

Location:

SWAN VALLEY, 0.38 AIR MILES SOUTH OF LINDBERGH LAKE RD., CA.  
1.5 AIR MILES WEST OF ST. HWY 83.

Element occurrence data:

EST. 51-1000 PLANTS (1983); 500-750 PLANTS (1989).

General site description:

GLACIAL POTHOLE, IN 0.5-1.5 FEET OF WATER; WITH SIUM SUAVE,  
CAREX ROSTRATA.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:

Information source:

PIERCE, J. 737 LOCUST ST., MISSOULA, MT 59802

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.044

Survey site name: LINDBERGH LAKE  
County: Missoula

USGS quadrangle: CYGNET LAKE

Township-range: 019N017W    Section: 12  
Township-range comments: S2SE4NE4, N2NE4SE4

Survey date:	1987-07-29	Elevation:	4215
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-18	Size (acres):	1

Location:

SWAN VALLEY, SOUTHEAST OF LINDBERGH LAKE RD., 2.0 AIR MILES  
WEST OF ST. HWY 83.

Element occurrence data:

EST. 275-400 PLANTS (1987); 90-120 PLANTS (1989); POND IS  
ALONGSIDE A HEAVILY USED GRAVEL ROAD, AND IS UNDER A POWER  
LINE.

General site description:

GLACIAL POTHOLE DEPRESSION; WITH CAREX VESICARIA, SIUM  
SUAVE, RANUNCULUS AQUATILIS; POPULUS TRICHOCARPA, P. TREMU-  
LOIDES, PINUS CONTORTA, LARIX OCCIDENTALIS AROUND POND.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.045

Survey site name: LINDBERGH LAKE  
County: Missoula

USGS quadrangle: CYGNET LAKE

Township-range: 019N016W    Section: 18  
Township-range comments: SE4SW4SE4

Survey date:	1987-07-10	Elevation:	4250
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-17	Size (acres):	2

Location:

SWAN VALLEY, 1.83 AIR MILES ESE OF NORTH END OF LINDBERGH LAKE, 1.08 AIR MILES SOUTH OF SWAN RIVER, CA. 2.0 AIR MILES WEST OF ST. HWY 83.

Element occurrence data:

EST. 300 PLANTS (1987); 300-400 PLANTS (1989).

General site description:

GLACIAL POTHOLE POND, SURROUNDED BY PINUS CONTORTA FOREST, POPULUS TREMULOIDES NEAR MARGIN; WITH CAREX VESICARIA, EQUISETUM FLUVIATILE, POTAMOGETON GRAMINEUS, SIUM SUAVE.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

VOUCHER - SHELLY, J.S. (1364) AND L. CAMPBELL, 1987, MONTU.

Information source:

CAMPBELL, L. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS. OF 2 JULY AND 9-10 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.046

Survey site name: LINDBERGH LAKE  
County: Missoula

USGS quadrangle: CYGNET LAKE

Township-range: 019N016W    Section: 18  
Township-range comments: SW4NW4NW4

Survey date:	1987-07-10	Elevation:	4230
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-18	Size (acres):	1

Location:

SWAN VALLEY, 0.58 AIR MILES SOUTH OF SWAN RIVER, 2.13 AIR  
MILES WEST OF ST. HWY 83.

Element occurrence data:

EST. 50 PLANTS (1987); 30-50 PLANTS (1989); ADJACENT AREAS  
DISTURBED BY CLEARCUT LOGGING.

General site description:

GLACIAL POTHOLE POND; WITH SIUM SUAVE, CAREX VESICARIA,  
TYPHA, RANUNCULUS GMELINII, POTAMOGETON GRAMINEUS.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

VOUCHER - SHELLY, J.S. (1368) AND L. CAMPBELL, 1987, MONTU.

Information source:

CAMPBELL, L. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 2 JULY AND 9-10 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.047

Survey site name: LINDBERGH LAKE  
County: Missoula

USGS quadrangle: CYGNET LAKE

Township-range: 019N016W    Section: 18  
Township-range comments: SW4NE4NW4

Survey date:	1987-07-10	Elevation:	4215
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-17	Size (acres):	1

Location:

SWAN VALLEY, 0.5 AIR MILES SOUTH OF SWAN RIVER, 1.95 AIR  
MILES WEST OF ST. HWY 83.

Element occurrence data:

EST. 200 PLANTS (1987); 200-300 PLANTS (1989); POND LOCATED  
ON EDGE OF A CLEARCUT.

General site description:

GLACIAL DEPRESSION; WITH SIUM SUAVE, CAREX VESICARIA, TYPHA  
LATIFOLIA, NUPHAR VARIEGATUM, ELEOCHARIS PALUSTRIS, SPAR-  
GANIUM MINIMUM; ALNUS ON EDGES, NO POPULUS.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

VOUCHER - SHELLY, J.S. (1365) AND L. CAMPBELL, 1987, MONTU.

Information source:

CAMPBELL, L. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 2 JULY AND 9-10 JULY.



HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.048

Survey site name: LINDBERGH LAKE  
County: Missoula

USGS quadrangle: CYGNET LAKE

Township-range: 019N016W    Section: 18  
Township-range comments: SW4NE4NW4

Survey date:	1987-07-10	Elevation:	4215
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-17	Size (acres):	1

Location:

SWAN VALLEY, 0.5 AIR MILES SOUTH OF SWAN RIVER, 1.89 AIR  
MILES WEST OF ST. HWY 83.

Element occurrence data:

EST. 250 PLANTS (1987); CA. 200 PLANTS (1989); ADJACENT  
AREAS DISTURBED BY CLEARCUT LOGGING.

General site description:

GLACIAL POTHOLE POND; WITH CAREX VESICARIA, SIUM SUAVE,  
EQUISETUM FLUVIATILE, TYPHA LATIFOLIA.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

VOUCHER - SHELLY, J.S. (1366) AND L. CAMPBELL, 1987, MONTU.

Information source:

CAMPBELL, L. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 2 JULY AND 9-10 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.049

Survey site name: LINDBERGH LAKE  
County: Missoula

USGS quadrangle: CYGNET LAKE

Township-range: 019N016W    Section: 07  
Township-range comments: SW4SW4SE4

Survey date:	1987-07-10	Elevation:	4150
First observation:	1987	Slope/aspect:	LEVEL
Last observation:	1989-07-17	Size (acres):	1

Location:

SWAN VALLEY, 0.16 AIR MILES SOUTH OF SWAN RIVER, 1.60 AIR  
MILES WEST OF ST. HWY 83.

Element occurrence data:

EST. 1500-2000 PLANTS (1987); 2000+ PLANTS (1989); POND IS  
ON NORTH SIDE OF A NEWLY CONSTRUCTED LOGGING ROAD, JUST  
NORTH OF USFS BOUNDARY.

General site description:

GLACIAL POTHOLE POND; WITH CAREX ROSTRATA, C. VESICARIA,  
RANUNCULUS GMELINII, R. AQUATILIS, ALOPECURUS AEQUALIS;  
POPULUS SPP., ALNUS INCANA, SALIX SPP. AROUND EDGE.

Land owner/manager:

PRIVATELY OWNED LAND (INDIVIDUAL OR CORPORATE)

Comments:

VOUCHER - SHELLY, J.S. (1369) AND L. CAMPBELL, 1987, MONTU.  
pH=7.29.

Information source:

SHELLY, J.S. 1987. FIELD SURVEYS IN LAKE AND MISSOULA COS.  
OF 23-26 & 30 JUNE, 1-17 & 28-30 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.056

Survey site name: LINDBERGH LAKE  
County: Missoula

USGS quadrangle: CYGNET LAKE

Township-range: 019N017W    Section: 02  
Township-range comments: W2SE4SE4

Survey date:	1989-07-18	Elevation:	4310
First observation:	1989	Slope/aspect:	LEVEL
Last observation:	1989-07-18	Size (acres):	1

Location:

SWAN RIVER VALLEY, CA. 7.5 MILES SSW OF CONDON, CA. 1.6  
MILES NORTH OF LINDBERGH LAKE.

Element occurrence data:

27 PLANTS IN 1989 (NONE WERE FOUND IN 1987); ALL PLANTS  
FOUND IN SOUTH END OF POND.

General site description:

SHALLOW POND SURROUNDED BY PINUS CONTORTA, POPULUS  
TREMULOIDES, AND POPULUS BALSAMIFERA, WITH SIUM SUAVE, CAREX  
VESICARIA, AND UTRICULARIA VULGARIS.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

Comments:

FLUCTUATING POND LEVEL LIKELY CAUSES CHANGES IN POPULATION  
SIZE.

Information source:

SCHASSBERGER, L.A. 1989. FIELD SURVEYS OF THE SWAN VALLEY,  
11-14 AND 17-20 JULY.

HOWELLIA AQUATILIS  
WATER HOWELLIA

Global rank: G2      Forest Service status: SENSITIVE LIST  
State rank: S2      Federal Status: C2

Element occurrence code: PDCAM0A010.057

Survey site name: LOST CREEK-CILLY CREEK PONDS  
County: Lake

USGS quadrangle: CILLY CREEK

Township-range: 024N017W    Section: 06  
Township-range comments: NW4SW4SE4

Survey date:	1989-07-07	Elevation:	3190
First observation:	1989	Slope/aspect:	LEVEL
Last observation:	1989-07-07	Size (acres):	1

Location:

SWAN VALLEY, CA. 4.5 AIR MILES SSE. OF SWAN LAKE (TOWN); 0.3  
AIR MILES EAST OF ST. HWY. 83; 0.68 AIR MILES SSW. OF  
CONFLUENCE OF NORTH AND SOUTH FORKS LOST CREEK.

Element occurrence data:

22 PLANTS COUNTED (1989); ALL INDIVIDUALS OCCUR NEAR NORTH  
END OF POND; REMAINDER OF POND IS SUITABLE, BUT APPARENTLY  
UNOCCUPIED, HABITAT; SURROUNDING FOREST CURRENTLY INTACT.

General site description:

GLACIAL POTHOLE POND, WITH BOTTOM SOIL OF CONSOLIDATED CLAY  
MUCK; WITH EQUISETUM FLUVIATILE, SIUM SUAVE, CAREX  
VESICARIA, ELEOCHARIS PALUSTRIS, GLYCERIA; POPULUS  
TRICHOCARPA, POPULUS TREMULOIDES, AND PICEA ENGELMANNII IN  
BORDERING FOREST.

Land owner/manager:

FLATHEAD NATIONAL FOREST, SWAN LAKE RANGER DISTRICT

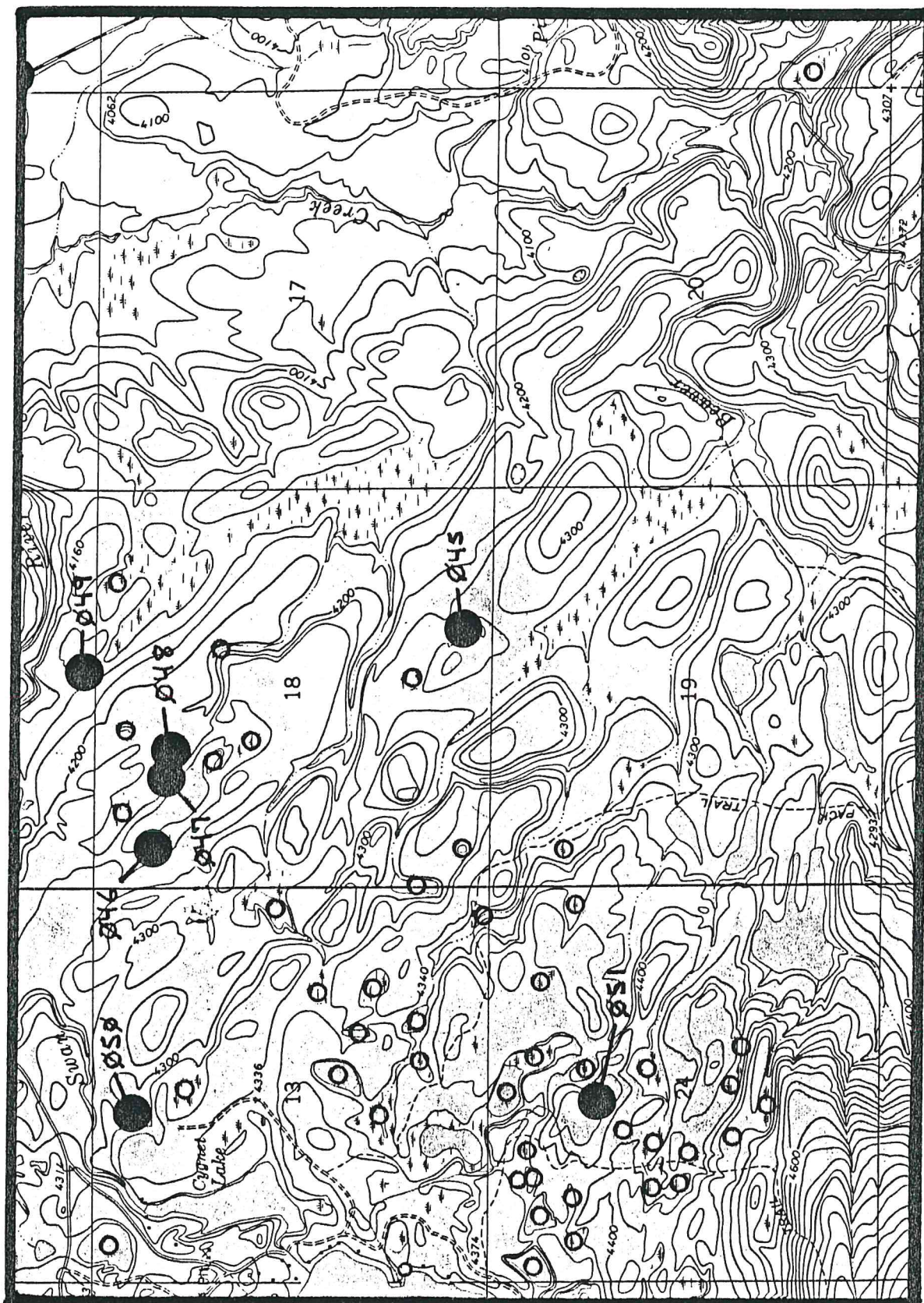
Comments:

SIGHT RECORD, NO VOUCHER SPECIMEN COLLECTED.

Information source:

SHELLY, J.S. 1989. FIELD SURVEYS IN SWAN RIVER VALLEY, LAKE  
AND MISSOULA COUNTIES, OF 5-7 AND 11-14 JULY.



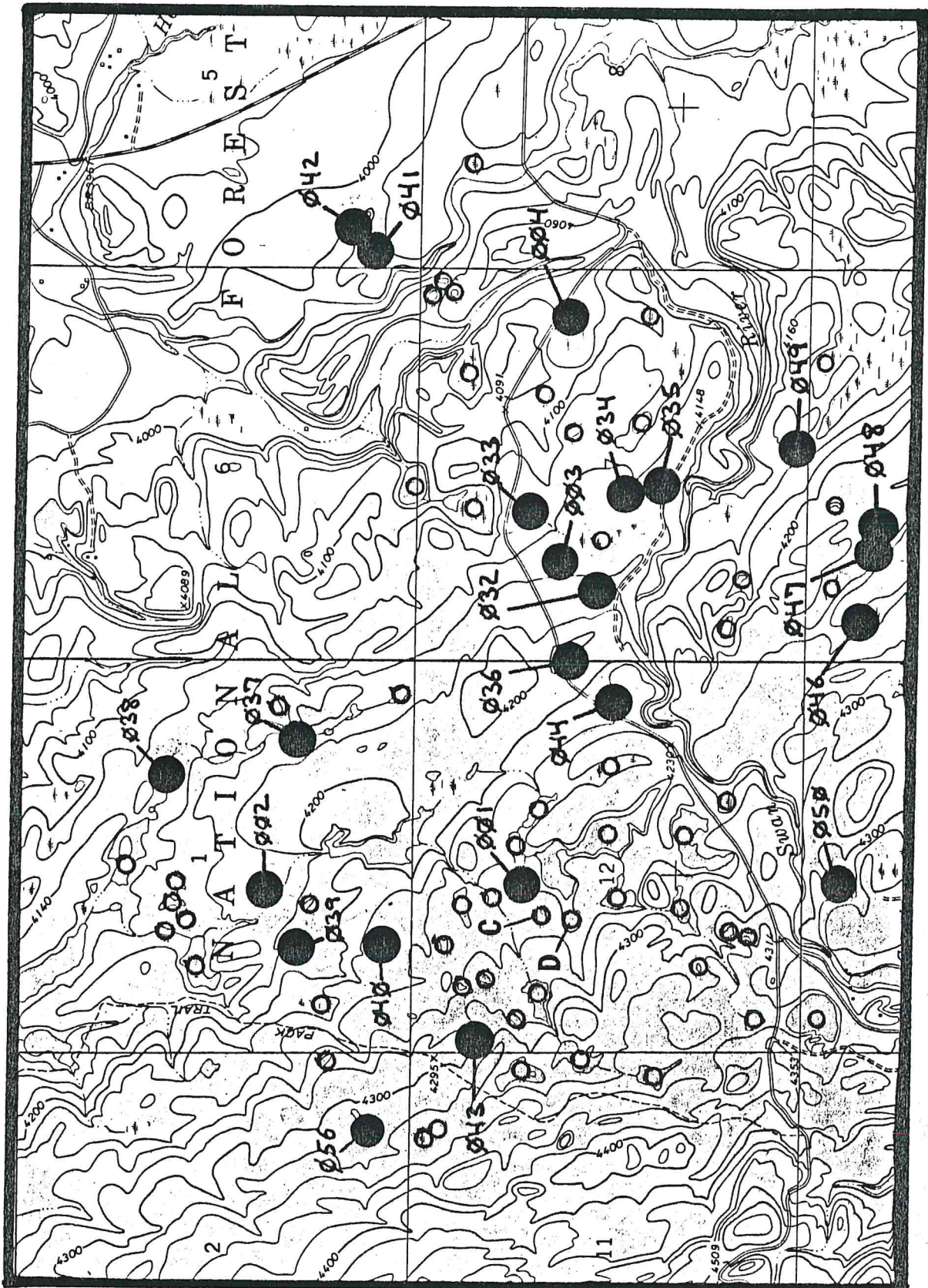


USGS Cygnet Lake Quadrangle (7.5')

Howellia aquatilis

- = element occurrences
- = areas unsuccessfully searched
- = suitable habitat re-surveyed in 1989, but species not found





USGS Cygnet Lake Quadrangle (7.5')

Howellia aquatilis

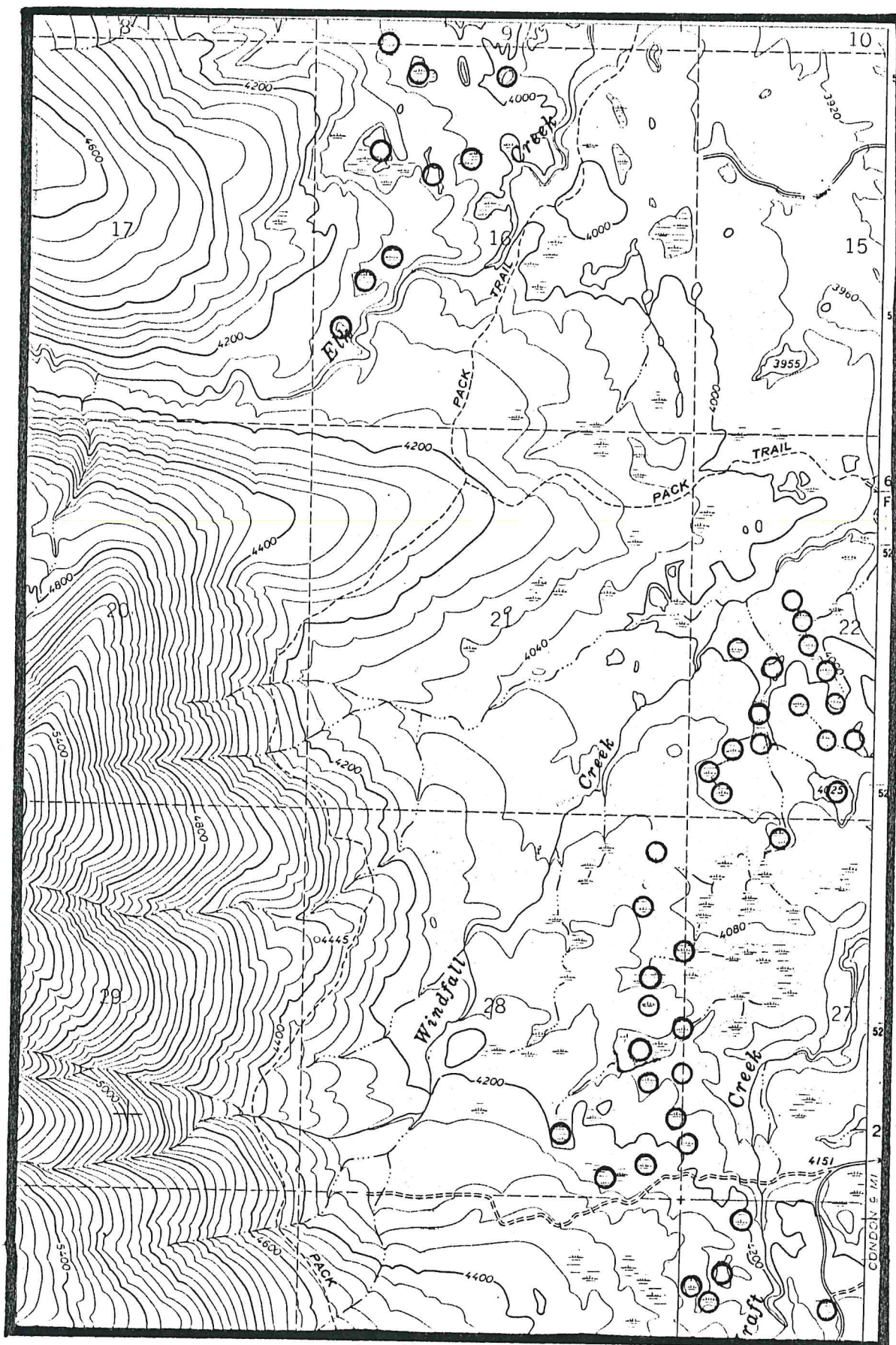
○ = transplant ponds (sites receiving soil plugs)

● = element occurrences

○ = areas unsuccessfully searched

○ = suitable habitat re-surveyed in 1989, but species not found

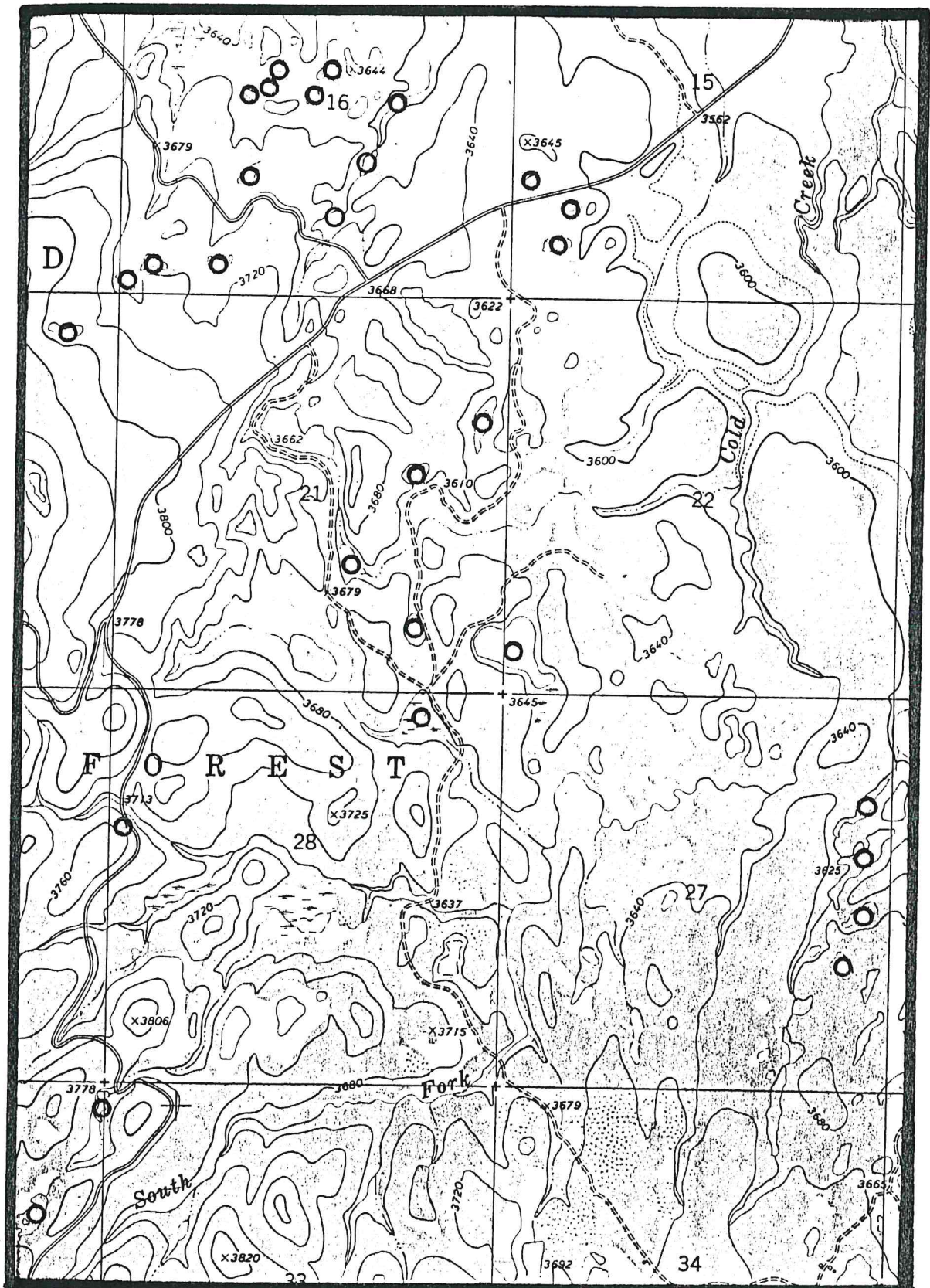




USGS Hemlock Lake Quadrangle (7.5')  
Howellia aquatilis

- = areas unsuccessfully searched in 1988
- = suitable habitat re-surveyed in 1989, but species not found





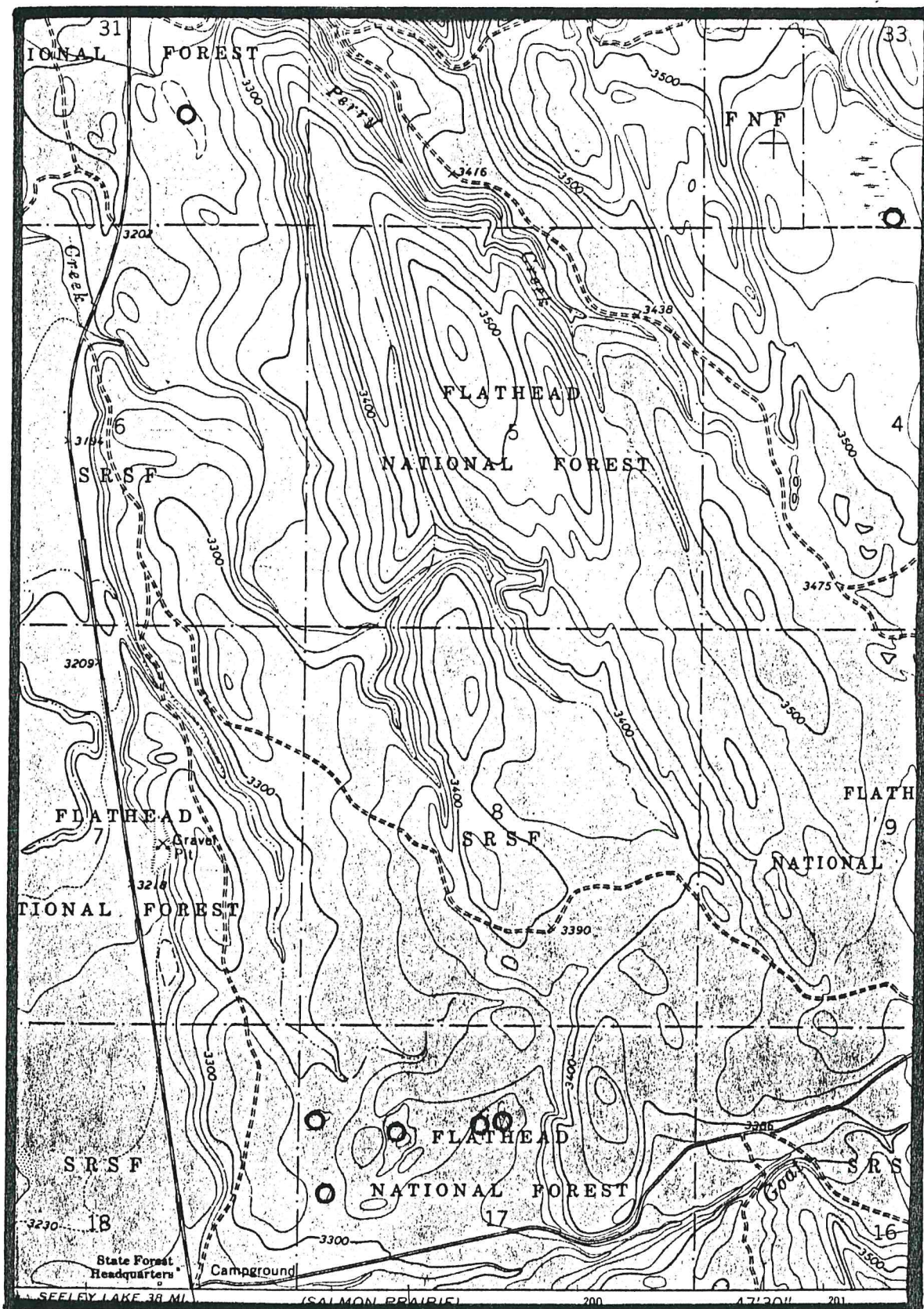
USGS Peck Lake Quadrangle (7.5')

Howellia aquatilis

○ = areas unsuccessfully searched

○ = suitable habitat re-surveyed  
in 1989, but species not found





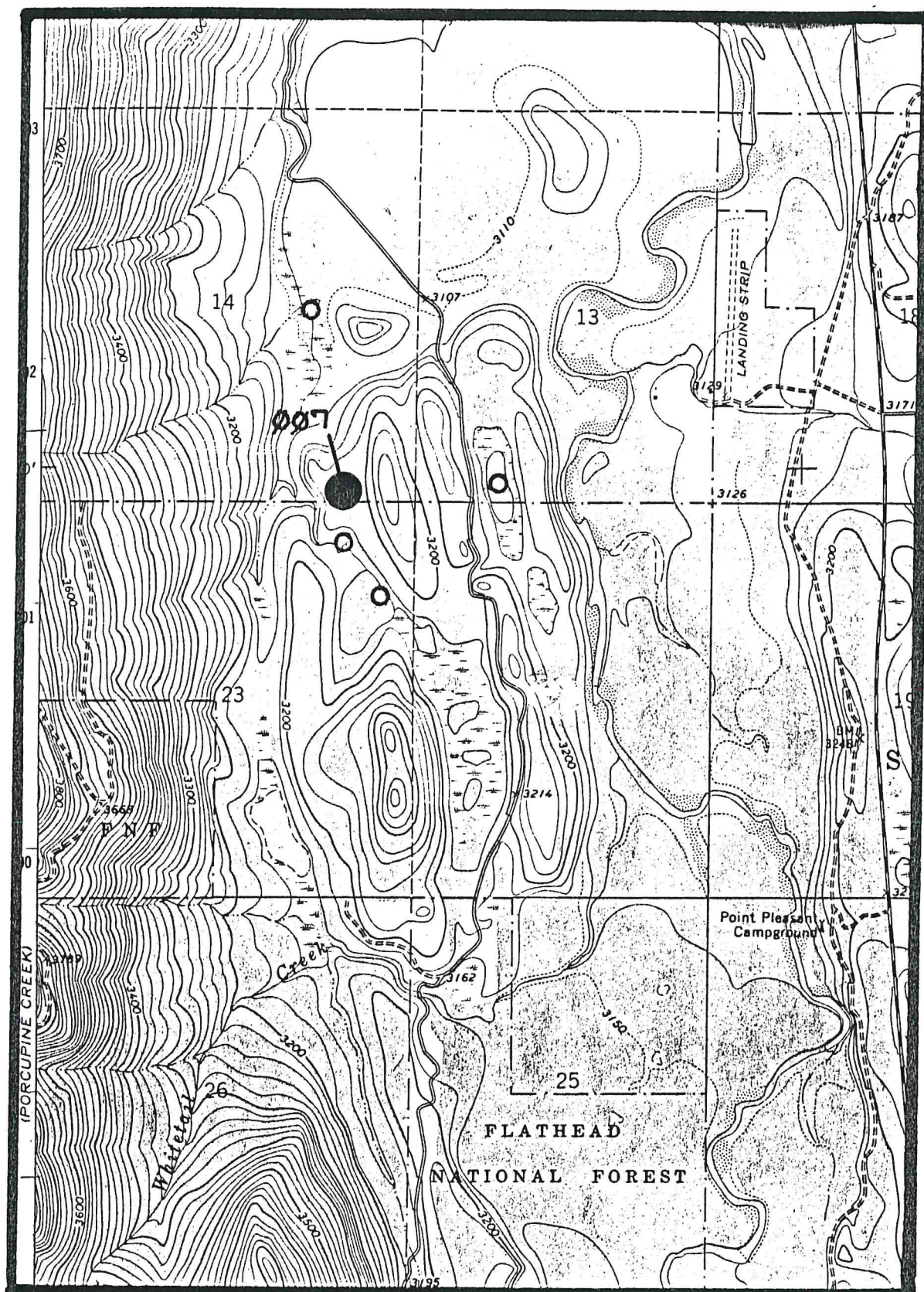
USGS Cilly Creek Quadrangle (7.5')

Howellia aquatilis

○ = areas unsuccessfully  
searched

○ = suitable habitat re-surveyed  
in 1989, but species not found



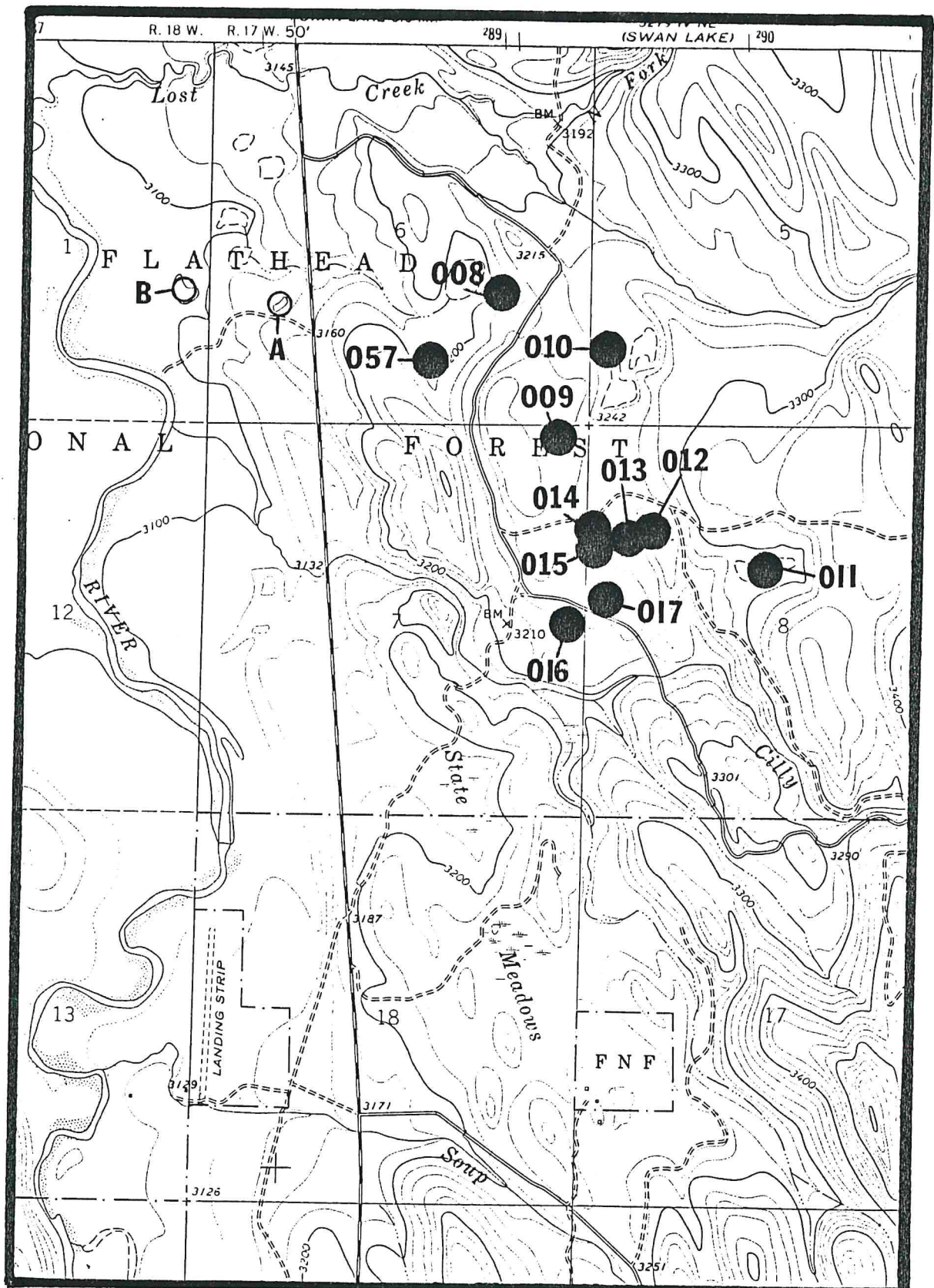


USGS Cilly Creek Quadrangle (7.5')

Howellia aquatilis

- = element occurrence
- = areas unsuccessfully searched
- = potential habitat re-surveyed in 1989, but species not found





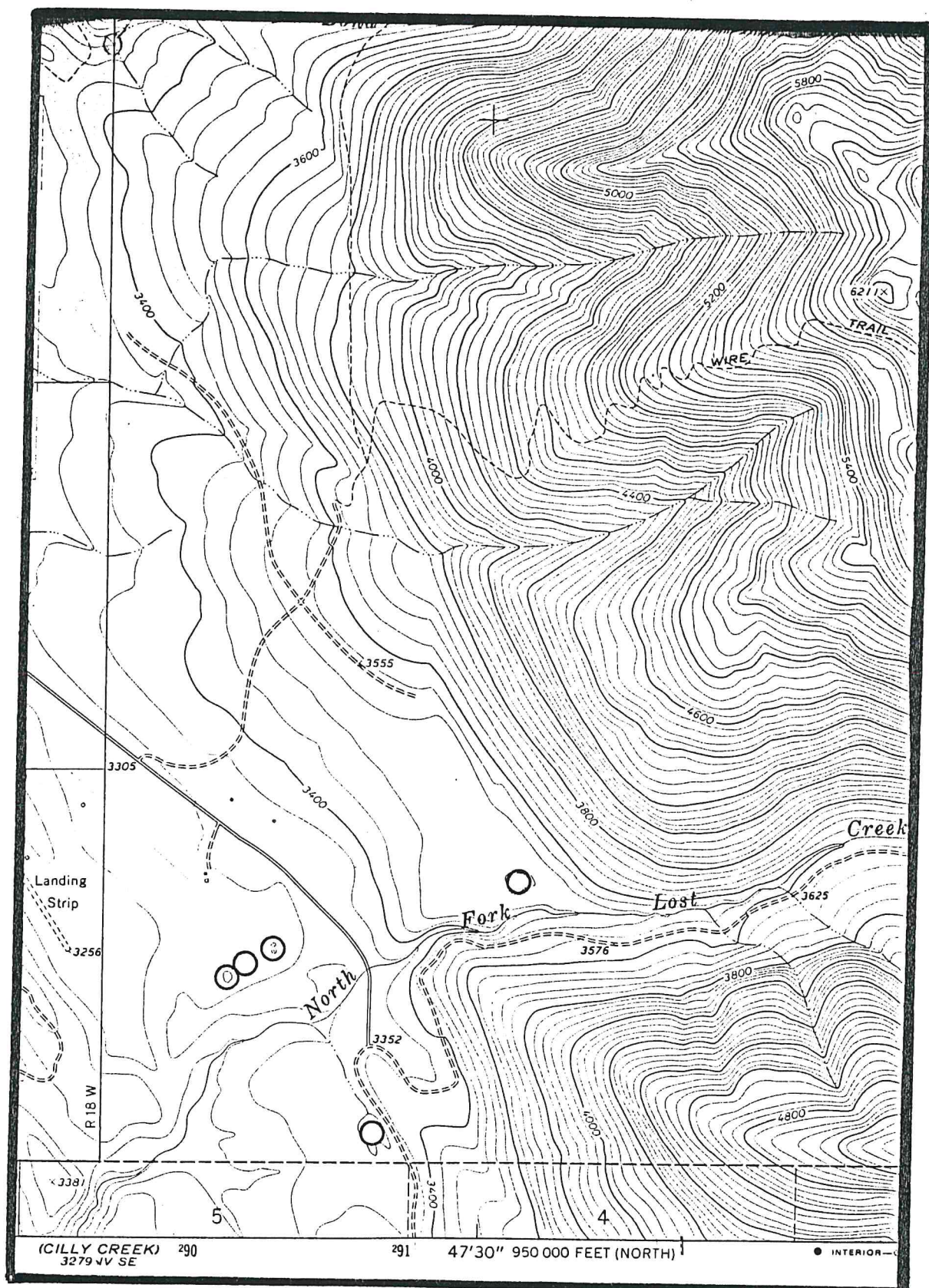
USGS Cilly Creek Quadrangle (7.5')

Howellia aquatilis

● = element occurrences

○ = transplant ponds (sites receiving soil plugs)





USGS Swan Lake Quadrangle (7.5')

○ = areas unsuccessfully searched  
for *Howellia aquatilis* (1989)

# VIII. LITERATURE CITED

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- Shelly, J.S. 1988. Status review of Howellia aquatilis, U.S. Forest Service - Region 1, Flathead National Forest, Montana. Unpublished report to USDA Forest Service, Flathead National Forest, Kalispell, Montana. Montana Natural Heritage Program, Helena. 120 pp.
- Shelly, J.S. 1989. Addendum to the status review of Howellia aquatilis, U.S.D.A. Forest Service - Region 1, Flathead National Forest, Montana. Unpublished report to USDA Forest Service, Flathead National Forest, Kalispell, Montana. Montana Natural Heritage Program, Helena. 17 pp.
- Shelly, J.S., and R. Moseley. 1988. Report on the conservation status of Howellia aquatilis, a candidate threatened species. Unpublished report to U.S. Fish and Wildlife Service, Denver, Colorado. Montana Natural Heritage Program, Helena. 166 pp.
- Reel, S., L. Schassberger, and W. Ruediger. 1989. Caring for Our Natural Community: Region 1 - Threatened, Endangered and Sensitive Species Program. U.S.D.A. Forest Service, Northern Region, Wildlife and Fisheries, Missoula, Montana. 309 pp. + appendices.
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- U.S. Department of Agriculture, Forest Service. 1988. Sensitive Plant Field Guide (Montana), Northern Region. U.S.D.A. Forest Service, Missoula, Montana.